**Drain cleaner**

![A drawing of a person

Description automatically generated]()

Sometimes chemicals are poured down the drain to get rid of any blockages.

Caustic soda is a type of drain cleaner. It is corrosive.

**DO NOT test or use drain cleaner yourself.**

Some students are discussing whether caustic soda is an acid or alkali.

**Freddie:** It must be an acid because it is corrosive.

**Sam:** I think it is an alkali because it is a type of cleaning product.

**Angelica:** It must be an acid because it can eat away blockages.

**Dexter:** I think it is an acid because acids are stronger than alkalis.

**Claudia:** I can’t tell whether it is an acid or an alkali. I need more information.

1. Who do you agree with and why?

|  |  |
| --- | --- |
| Cards for  **Drain cleaner** | **Sam:** I think it is an alkali because it is a type of cleaning product. |
| **Freddie:** It must be an acid because it is corrosive. | **Dexter:**  I think it is an acid because acids are stronger than alkalis. |
| **Angelica:** It must be an acid because it can eat away blockages. | **Claudia:** I can’t tell whether it is an acid or alkali. I need more information. |

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| Cards for  **Drain cleaner** | **Sam:** I think it is an alkali because it is a type of cleaning product. |
| **Freddie:** It must be an acid because it is corrosive. | **Dexter:**  I think it is an acid because acids are stronger than alkalis. |
| **Angelica:** It must be an acid because it can eat away blockages. | **Claudia:** I can’t tell whether it is an acid or alkali. I need more information. |

*Chemistry > Big idea CSU: Substances and properties > Topic CSU3: Acids and alkalis > Key concept CSU3.1: pH scale*

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| --- |
| **Response activity** |
| **Drain cleaner** |

**Overview**

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| Learning objective: | Acidic and alkaline solutions may be compared using the pH scale. |
| Observable learning outcome: | Describe how to find out, safely, whether a solution is an acid or an alkali. |
| Activity type: | talking heads |
| Key words: | acid, alkali, indicator, litmus |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic questions:

* Identifying acids
* Identifying alkalis

**What does the research say?**

Research suggests that students’ perceptions of acids arise from either from their own sensory experiences such as tasting vinegar or lemon juice (Driver et al., 1994) or from what they hear or read about in the media (for example acid rain, acid attacks or antacid tablets).

The two major conceptions found by Hand and Treagust (1989) were that ‘acids eat material away’ and ‘acids burn you’. This may be why some students were found to think that the only way to test for an acid is to find out if it eats something away.

Research reported by Nakhleh and Krajcik (1994) suggested misunderstandings about the nature of bases (an alkali is a soluble base) namely that bases are not harmful and that acids are strong but bases are not.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. The statements are also provided as cut-out cards for students to physically organise.

Students should work together to follow the instructions on either the worksheet or the PowerPoint. Giving each group one worksheet to complete between them is helpful for encouraging discussion, but each member should be able to report back to the class. Listening in to the conversations of each group will often give you insights into how your students are thinking.

If there is disagreement when you take feedback, a good way to progress might be through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs.

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in each group. For example, you may choose to select a student with strong prior knowledge as a scribe. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

**Expected answers**

There is not enough information to tell (without prior knowledge) whether caustic soda is an acid or an alkali. It would be necessary to test using an indicator such as litmus.

**DO NOT test commercial drain cleaner in school. Commercial drain cleaner may contain a mix of chemicals including caustic soda (sodium hydroxide). For detailed hazard information about Sodium Hydroxide please refer to CLEAPSS Hazcard 91A.’**

**Acknowledgments**

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**References**

Driver, R., et al. (1994). *Making Sense of Secondary Science: Research into Children's Ideas,* London, UK: Routledge.

Hand, B. and Treagust, D. F. (1989). Application of a conceptual conflict teaching strategy to enhance student learning of acids and bases. *Research in Science Education,* 19**,** 133-144.

Nakhleh, M. B. and Krajcik, J. S. (1994). Influence of levels of information as presented by different technologies on students' understanding of acid, base and pH concepts. *Journal of Research in Science Teaching,* 31(10)**,** 1077-1096.